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### (54) RESIN COMPOSITION FOR SHIELDING ELECTROMAGNETIC WAVE

#### (57)Abstract:

PROBLEM TO BE SOLVED: To obtain a resin composition for shielding an electromagnetic wave excellent in mechanical characteristics, molding property, appearance of a molded product and coloring property.

SOLUTION: This resin composition for shielding an electromagnetic wave comprises (A) 100 pts.wt. thermoplastic resin (a rubber-reinforced styrenic resin or a mixture of the rubber-reinforced styrenic resin and other thermoplastic resin), (B) 5-30 pts.wt. fiber covered with a metal, (C) 3-20 pts.wt. zinc oxide whisker and (D) 0.5-10 pts.wt. titanium oxide.

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## DETAILED DESCRIPTION

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### [Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] This invention relates to the resin constituent for electromagnetic wave electric shielding. It is related with the resin constituent for electromagnetic wave electric shielding which was excellent in the mechanical property which comes to blend metallic-coating fiber, a zinc oxide whisker, and titanium oxide, a moldability, mold-goods appearance, and coloring nature in detail.

[0002]

[Description of the Prior Art] There are a method of performing surface treatment, such as conductive coating material, electromagnetic wave electric shielding plating, and zinc spraying, to the fabricated resin mold goods as a method of generally electric-conduction-izing thermoplastics, the method of blending and fabricating conductive fillers, such as a metal powder, carbon black, a metal flake, a metal fiber, and a carbon fiber, in thermoplastics, etc. However, in order that the method by surface treatment may carry out the need of the processing process which carries out electric conduction processing to the fabricated resin mold-goods front face, especially the electric conduction processing to the resin mold goods which have a complicated configuration is complicated, and it has the defect of a conductive layer tending to exfoliate. Moreover, the method of fabricating from the resin constituent which blended the conductive filler is advantageous from there being no fear of not needing special post processing but a conductive layer exfoliating. However, the resin constituent which blended particle-like conductivity fillers, such as carbon black, a metal powder, and a metal flake, for example has inadequate conductivity, and since loadings moreover become abundant, the mechanical property has the defect which falls remarkably. Moreover, it is easy to cut fiber at the time of melting kneading, loadings must be made [ many ] more than an initial complement, and the resin constituent which blended fibrous conductivity fillers, such as a metal fiber and a carbon fiber, has mechanical and the defect which are a moldability and mold-goods appearance of getting worse, although conductivity is good and useful as a resin constituent for electromagnetic wave electric shielding as compared with the case where the thermal property improved and a particle-like conductivity filler is blended.

[0003] Furthermore, since the design nature is also required in the use as which these electromagnetic wave electric shielding nature is required, for example, the game machine with which the need is extended in recent years, the resin constituent excellent in especially coloring nature is demanded. However, in the actual condition, the resin constituent excellent in coloring nature for electromagnetic wave electric shielding is not obtained. For this reason, the appearance of the resin constituent for electromagnetic wave electric shielding which has the outstanding electromagnetic wave shielding effect, and was excellent in a mechanical property, a shaping fluidity, surface appearance, and coloring nature is demanded.

[0004]

[Problem(s) to be Solved by the Invention] This invention aims at offering the resin constituent for electromagnetic wave electric shielding which has the outstanding electromagnetic wave shielding

effect, and was excellent in a mechanical property, a shaping fluidity, surface appearance, and coloring nature.

[0005]

[Means for Solving the Problem] this invention persons reached [ that a resin constituent for electromagnetic wave electric shielding excellent in a mechanical property, a moldability, mold-goods appearance and coloring nature is obtained and ] a header and this invention by blending metallic-coating fiber, a zinc oxide whisker, and titanium oxide to thermoplastics, as a result of repeating examination wholeheartedly that the above-mentioned object should be attained. namely, -- this invention -- thermoplastics -- (-- A --) -- 100 -- weight -- the section -- receiving -- metallic coating -- fiber -- (-- B --) -- five -- -- 30 -- weight -- the section -- a zinc oxide -- a whisker -- (-- C --) -- three -- -- 20 -- weight -- the section -- and -- titanium oxide -- (-- D --) -- 0.5 -- -- ten -- weight -- the section -- blending -- becoming -- an electromagnetic wave -- electric shielding -- \*\* -- resin --

[0006] As thermoplastics used in this invention, rubber consolidation styrene resin, such as HIPS resin, ABS system resin, AES system resin, AAS system resin, and MBS system resin, polycarbonate resin, polybutyrene terephthalate resin, polyethylene terephthalate resin, polyamide resin, polypropylene resin, polyphenylene oxide resin, polyphenylene sulfide resin, etc. are raised. It is among these especially desirable that it is the mixture of rubber consolidation styrene resin or rubber consolidation styrene resin, and other thermoplastics. moreover, a mixing ratio at the time of mixing rubber consolidation styrene resin and other thermoplastics -- although there is especially no limit in a rate, it is desirable that they are 5 - 100 % of the weight of rubber consolidation styrene resin and 0 - 95 % of the weight of other thermoplastics, and it is especially desirable that they are 10 - 100 % of the weight of rubber consolidation styrene resin and 0 - 90 % of the weight of other thermoplastics.

[0007] As metallic-coating fiber (B) used in this invention, although a nickel coat carbon fiber, a nickel coat glass fiber, etc. are mentioned, especially a nickel coat carbon fiber is desirable. In addition, in this invention, the usual carbon fiber, a glass fiber, etc. may be blended with the above-mentioned metallic-coating fiber in the range which does not bar the effect.

[0008] As for a zinc-oxide whisker (C) used in this invention, what has the tetrapod mold crystal structure is desirable. Moreover, this zinc oxide whisker may use that by which surface treatment was carried out if needed in coupling agents, such as a silane coupling agent, a titanate system coupling agent, and an aluminate coupling agent.

[0009] as the titanium oxide (D) used in this invention -- a rutile mold and an anatase mold -- it is -- both -- although it is usable, what has especially the crystal structure of a rutile mold is desirable. That to which surface treatment of these titanium oxide was usually carried out by aluminum, silica, silane system coupling agent, titanate system coupling agent, a silicone oil, etc. is used.

[0010] this invention -- resin -- a constituent -- the above -- thermoplastics -- (-- A --) -- 100 -- weight -- the section -- receiving -- metallic coating -- fiber -- (-- B --) -- five -- -- 30 -- weight -- the section -- a zinc oxide -- a whisker -- (-- C --) -- three -- -- 20 -- weight -- the section -- and -- titanium oxide -- (-- D --) -- 0.5 -- -- ten -- weight -- the section -- combination -- carrying out -- becoming -- an If metallic-coating fiber (B) is inferior to an electromagnetic wave shielding effect in under 5 weight sections and exceeds 30 weight sections, it is not inferior [ a mechanical strength and a moldability ], and desirable. If a zinc-oxide whisker (C) is inferior to an electromagnetic wave shielding effect in under 3 weight sections and 20 weight sections are exceeded, it is not inferior [ a mechanical strength and a moldability ], and desirable. It is not desirable in order will be inferior to a mechanical strength and a moldability and to check an electromagnetic wave shielding effect further, if titanium oxide (D) is inferior to coloring nature in under the 0.5 weight section and 10 weight sections are exceeded.

[0011] After a resin constituent of this invention mixes beforehand two components of a package or arbitration, or three components for the above (A), (B), (C), and the (D) component, it can be obtained by a method of mixing the remaining components etc. Moreover, on the occasion of mixing, it is mixable using an extruder of a well-known mixer, for example, a monopodium, or two shafts, a Banbury mixer, a kneader, a roll, etc.

[0012] An additive of arbitration, for example, a thermostabilizer, an antioxidant, light stabilizer, a

flame retarder, a fire-resistant assistant, a drip inhibitor, a release agent, a plasticizer, a coloring agent, lubricant, a foaming agent, etc. may be blended with a resin constituent of this invention if needed.

[0013] [Example] -- although an example is raised to below and this invention is further explained to it, this invention is not restricted at all by them. In addition, each assessment in this invention was performed by the following method.

[0014] Shock resistance: Apply to ASTM D-256 correspondingly. Notch-less Izod impactive strength was measured with the 1/8 inch test piece.

Moldability (the minimum filling pressure): It asked for the minimum filling pressure according to the process condition shown below using Sanjo Seiki SAV-100 injection molding machine. The minimum filling pressure shows minimum injection pressure (gage pressure of a making machine) required in order to obtain mold goods.

molding-temperature: -- 230-degree-C die-temperature: -- 50-degree-C injection-speed: -- 50% coloring nature: -- 0.05 weight section addition of the color shown below was carried out to the (Thermoplastics A) 100 weight section, and the plate of 50x75x3 (mm) which fabricated the resin constituent which may have had the metallic-coating fiber of the specified quantity, a zinc oxide whisker, and titanium oxide added according to the above-mentioned process condition was judged visually. The color used here is red... It is a product made from \*-ized Color. SUMIPU last Red HFG blue ... Product made from \*-ized Color SUMIPU last Blue OR yellow ... Product made from \*-ized Color SUMIPU last It is Yellow HLR. : All three colors can be classified by color visually, and it is clear.

x: One or more of three colors are not clear, and classification by color is difficult.

Appearance: According to the process condition shown in the above-mentioned moldability assessment method, a glossmeter and viewing estimated using the fabricated plate of 50x75x3 (mm). : the gloss of the mold-goods mirror plane section -- 70% or more -- it is -- a visual judgment -- setting -- the local gloss of x:mold-goods mirror plane section as which it collects and the section is not regarded of fiber -- 70% or less -- or According to the process condition shown in the local electromagnetic wave electric shielding nature \*\* electromagnetic wave shielding effect above-mentioned moldability assessment method of fiber that collect and the section is seen, in a visual judgment the fabricated plate of 150x150x2 (mm) -- using -- ADVANTEST -- the electromagnetic wave shielding effect of the core of the plate in 500MHz electric field was measured in law. The numeric value in a table is the average of the sample of n= 5.

\*\* Like the technique of stability \*\*, measure the electromagnetic wave shielding effect of the both ends of a plate (average of n= 5), make into O that whose difference with the measured value of the center section of \*\* is less than \*\*20%, and make into x that the difference of whose is \*\*20% or more on the other hand.

[0015] - (Thermoplastics A)-A-1 : ABS Plastics ( Clara Stick GA[ by Sumika ABS Latex Co. ]- 704)

A-2: The above-mentioned ABS plastics and polycarbonate resin ( caliber 200-20 made from Sumitomo Dow-Jones) were mixed by 50/50 of ratios.

A-3: The above-mentioned ABS plastics and polyamide resin ( nylon 6 by Unitika, Ltd. A-1030 BRL) were mixed by 50/50 of ratios.

A-4: The above-mentioned ABS plastics and polybutyrene terephthalate resin (Polyplastics Jura NEKKUSU 400 FP) were mixed by 50/50 of ratios.

[0016] - Metallic-Coating (Fiber B)-B-1 : Nickel Coat Carbon Fiber ( BESUFAITO [ by Toho Rayon Co., Ltd. ] MCHTA-C6-US)

B-i: Carbon fiber (BESUFAITO [ by Toho Rayon Co., Ltd. ] HTA-C6-SR)

- Zinc-Oxide (Whisker C)-C-1 : Product made from Matsushita Amtech PANATETORA

- Titanium Oxide (D)-D-1 : Gray TOREIKUSU Chemical Made in Corporation RTC-30 [0017]

[Examples 1-5 and the examples 1-6 of a comparison] It mixed about the - (D) component (above-mentioned [ A ]) at a rate shown with a table 1, melting kneading was carried out using the twin screw extruder, and the pellet was obtained. About the obtained pellet, various test pieces were produced with the injection molding machine, and each assessment was performed. In addition, about the test piece for coloring nature assessment, the pellet which blended 0.05 sections of three kinds of colors respectively

at the time of the above-mentioned melting kneading, and was obtained at it was used. A result is shown in a table 1.

[0018]

[A table 1]

	実 施 例					比 較 例					
	1	2	3	4	5	1	2	3	4	5	6
<組 成 (重量部)>											
—熱可塑性樹脂(A)—											
A-1	100	100				100	100	100	100	100	100
A-2			100								
A-3				100							
A-4					100						
—金屬被覆纖維(B)—											
B-1	15	10	15	15	15	3	15	15	35	15	
B-1		5									15
—酸化亜鉛ウイスキー(C)—											
C-1	10	10	10	10	10	10	1	10	10	25	10
—酸化チタン(D)—											
D-1	3	5	3	3	3	3	3		3	3	3
<特 性>											
○耐衝撃性(kg・cm/cm)	20	19	40	28	25	40	30	22	15	5	21
○成形性(最低充填圧力) (kg/cm <sup>2</sup> )	50	48	65	42	45	40	45	49	80	75	52
○着色性	○	○	○	○	○	○	○	×	×	○	○
○外観	○	○	○	○	○	○	×	○	×	○	○
○電磁波遮蔽性											
①電磁波遮蔽効果(dB)	80	70	78	82	75	5	60	75	100	85	15
②安定性	○	○	○	○	○	○	×	○	×	○	×

[0019]

[Effect of the Invention] The constituent of this invention sees [ have the outstanding coloring nature and an electromagnetic wave shielding effect, and excel in a moldability, surface appearance, and a mechanical strength, can use it suitably in the broad industrial field which begins the case of electronic equipment etc. and needs electromagnetic wave electric shielding, and ] industrially and is useful.

[Translation done.]